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Can Physicians Treat Tuberculosis? Report on a National Survey of Physician Practices

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ABSTRACT

Objectives. Researchers examined physicians' treatment strategies for tuberculosis to determine whether they would follow recommendations of the Centers for Disease Control and Prevention and the American Thoracic Society.

Methods. A national survey sampled 1772 physicians. Analyses tested correlates of recommended treatment regimens.

Results. Among respondents, 59.4% described a recommended regimen. Specialists; physicians aware of professional publications, treatment recommendations, and reporting requirements; and those having more than 50% of patients in nursing homes were more likely to describe recommended regimens. Physicians who had been in practice longer, relied on personal experience, or had more than 50% of patients receiving Medicaid were less likely to describe recommended regimens.

Conclusions. Physicians who treat tuberculosis require training and support. Policymakers should consider who should treat tuberculosis and how recommended practice should be ensured. (*Am J Public Health.* 1997;87:2008–2011)

Introduction

Inadequate treatment strategies contribute to poor outcomes for tuberculosis patients and to the emergence of drug resistance.[1–3] Surveys of physicians have revealed poor adherence to recommended treatment guidelines[2,4] and a lack of consensus among pulmonologists concerning the best regimen for tuberculosis.[4] We conducted a national survey of physicians to assess whether they would follow recommendations of the Centers for Disease Control and Prevention/American Thoracic Society (CDC/ATS) for tuberculosis treatment.

Methods

Physicians practicing in areas that reported at least five cases of tuberculosis between 1985 and 1989 were selected from the American Medical Association database of active physicians. This sample was stratified into generalists (family and general practitioners, pediatricians, and internal medicine specialists) and specialists (pulmonologists, geriatricians, infectious disease specialists), and by year of graduation from medical school (1941 to 1965, 1966 to 1980, or 1981 to 1991); 600 physicians were randomly selected from each of the resulting six strata.

The outcome measure asked respondents to describe one example of the usual regimen they use or would use in treating active tuberculosis. Responses were coded to reflect treatment recommendations extant in 1992[5]: (1) recommended regimen: (a) isoniazid, rifampin, and pyrazinamide for 2 months, with or without streptomycin and/or ethambutol, followed by isoniazid and rifampin for 4 months, or for 7 months if the patient has tested positive for human immunodeficiency virus; (b) isoniazid and rifampin for 9 months (with or without streptomycin and/or ethambutol); (2) excessive regimen: drugs for longer than the recommended duration—for example, (a) more than 6 months of isoniazid and rifampin with pyrazinamide for more than 2 months, or (b) more than 9 months of isoniazid and rifampin; (3) insufficient regimen: ineffective drug combinations and/or too short treatment durations—for example, no pyrazinamide in a regimen shorter than 9 months, or only one drug.

Cochran-Mantel-Haenszel analysis was used to produce odds ratios (ORs) adjusted for specialist vs generalist and year of graduation from medical school. This analysis identified significant covariates of the outcome measure. Logistic regression analysis, used to check for confounding factors, began with these significant covariates and explored alternative models using stepwise regression with forward addition and backward deletion. The final logistic model included variables that remained significant at $\alpha = .05$. The analysis used SAS for personal computers,[6] Epi Info Version 6.12,[7] and SAS 6.0 on an IBM mainframe.[8]

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Results

Of 3600 selected physicians, 445 could not be contacted or had retired or died and 1772 responded, giving a response rate of 56.2%. Table 1 compares respondents with nonrespondents. Frequencies between the two groups differed within specialty areas ($\chi^2 = 66$, $P < .001$), although percentages for each specialty area were similar. There were fewer foreign-trained physicians among respondents compared with nonrespondents ($\chi^2 = 280$, $P < .001$). Table 2 describes respondents.

There were 1423 usable responses to the outcome measure: 1080 (75.9%) currently had patients with active tuberculosis or infection, and 1234 (86.7%) reported previous tuberculosis patients; 845 (59.4%) described recommended regimens, 404 (28.4%) described adequate but excessive regimens, and 174 (12.2%) described insufficient regimens (including 57 [4%] who described one drug to treat active tuberculosis). Among those with current tuberculosis patients, 66.1% described a recommended regimen, 26.8% described an excessive regimen, and 7.1% described an insufficient regimen.

Of 1393 respondents, 72.9% would see active cases monthly and 17.9% would see them less often. Of 1406 respondents, 70.6% would order sputum examinations monthly but 14.2% would not order exams after diagnosis. Of 874 respondents, 34.2% would order chest radiographs monthly and 7.6% would order them at the start or at the start and end of treatment.

Table 3 shows the results of the Cochran-Mantel-Haenszel analysis. It summarizes all significant associations between the outcome variable and physician and practice characteristics.

Logistic regression analysis was used to adjust for possible confounding and to identify variables that differentiated significantly between providers who described recommended or nonrecommended regimens. Forward and backward stepwise procedures yielded identical models. No significant two-way interactions were found. Results of the logistic regression analysis (not shown on a table) are as follows.

Prescribing recommended regimens was associated with (1) infectious disease or pulmonology specialization compared with all other categories of physician training (OR = 2.62; 95% confidence interval [CI] = 2.02, 3.39), (2) being in practice 1 to 7 years compared with 14 to 25 years (OR = 0.61; 95% CI = 0.45, 0.84) or more than 25 years (OR = 0.48; 95% CI = 0.34, 0.67), (3) use of professional publications for tuberculosis information (OR = 1.7; 95% CI = 1.27, 2.50), (4) awareness of CDC/ATS recommendations for tuberculosis control (OR = 1.53; 95% CI = 1.11, 2.10), (5) awareness of the reporting requirement for tuberculosis (OR = 2.06; 95% CI = 1.28, 3.31), and (6) having more than 50% of patients resident in nursing homes (OR = 1.33; 95% CI = 1.04, 1.71). Not prescribing recommended regimens was associated with use of personal experience for tuberculosis information (OR = 0.70; 95% CI = 0.55, 0.90) and having more than 50% of patients receiving Medicaid (OR = 0.60; 95% CI = 0.42, 0.86).

TABLE 1—Comparison of Respondents with Nonrespondents

	Respondents (n = 1772) No. (%)	Nonrespondents (n = 1824[a]) No. (%)
Specialty		
Internal medicine	302 (17.0)	414 (22.7)
Family practice	188 (10.6)	267 (14.6)
Pediatrics[b]	179 (10.1)	201 (11.0)
Geriatrics	128 (7.2)	123 (6.7)
General practice[c]	86 (4.9)	120 (6.6)
Pulmonology[d]	646 (36.5)	545 (29.9)
Infectious diseases	243 (13.7)	154 (8.4)
Year of graduation		
1941–1965	591 (33.4)	645 (35.4)
1966–1980	598 (33.8)	590 (32.3)
1981–1991	583 (32.9)	589 (32.3)
Location of training		
United States	1362 (76.9)	911 (49.9)
Foreign	410 (23.1)	913 (50.1)
Sex		
Male	1467 (82.8)	1499 (82.2)
Female	305 (17.2)	325 (17.8)

[a] Excludes 4 physicians with unusable addresses; includes 355 physicians with inaccurate addresses or phone numbers, 82 retirees, and 10 deceased physicians.
[b] Includes pediatrics (n = 170) and neo-perinatal medicine (n = 9).
[c] Includes general practice (n = 82) and public health (n = 4).
[d] Includes pulmonology (n = 637) and pediatric pulmonology (n = 9).

TABLE 2—Characteristics of Responding Physicians (n = 1772)

	No. (%)
Years in practice	
1–7 y	466 (26.3)
8–13 y	385 (21.7)
14–25 y	440 (24.8)
25+ y	413 (23.3)
Did not respond	68 (3.8)
Geographical setting[a]	
Urban	628 (35.4)
Suburban	589 (33.2)
Inner city	334 (18.9)
Rural	92 (5.2)
Did not respond	129 (7.3)
Organizational setting	
Group	738 (41.7)
Solo	521 (29.4)
Institutional	277 (15.6)
Academic hospital	101 (5.7)
Preferred provider organization/ health maintenance organization	67 (3.8)
Military hospital	52 (2.9)
Government	41 (2.3)
Public health	16 (0.9)
Other	147 (8.3)
Did not report	89 (5.0)

[a] As defined in the survey questionnaire: urban = city of 250 000 residents; suburban = fringe of city; inner city = central area of city with high percentage of low-income and minority residents; rural = area with fewer than 2500 residents.

Discussion

Respondents were primarily private sector providers. Most had some experience with tuberculosis, but many described an inappropriate treatment regimen. Appropriate treatment was more likely among specialists, but 24% to 29% of specialists described a regimen of too long a duration and 5% described a regimen that could lead to further transmission and drug resistance. Physicians aware of treatment recommendations and reporting requirements were more likely to describe a recommended regimen. Many respondents would see patients with active tuberculosis less than once a month or would not order follow-up sputum exams. More than one third would order excessive chest radiographs. Physicians primarily serving Medicaid patients

TABLE 3—Associations between Physician and Practice Characteristics and the Treatment Regimens Described

	No.	Percentage Reporting Each Treatment Regimen			χ^2	P
		Recommended	Excessive	Insufficient		
Specialty						
Infectious diseases	230	65.7	29.1	5.2		
Pulmonology	609	71.1	23.7	5.3		
All others	584	44.7	33.1	22.3		
Total	1423	59.4	28.4	12.2	127.7	< .001
Years in practice						
1–7	406	66.5	24.9	8.6		
8–13	332	64.5	26.8	8.7		
14–25	366	56.8	28.1	15.0		
25 +	287	48.1	35.2	16.7		
Total	1391	59.7	28.3	12.0	33.1	< .001
Geographical setting						
Inner city	278	53.2	36.3	10.4		
Urban	530	60.8	28.1	11.1		
Suburban	456	60.8	26.5	12.7		
Rural	78	62.8	21.8	15.4		
Total	1342	59.3	28.9	11.8	13.4[a]	= .04
Location of medical school						
United States	1087	61.6	25.9	12.4		
Foreign	336	52.1	36.3	11.6		
Total	1423	59.4	28.4	12.2	9.6[a]	= .008
Has diagnosed active tuberculosis						
Yes	1239	61.8	28.1	10.1		
No	175	41.7	31.4	26.9		
Total	1414	59.3	28.5	12.2	10.2[a]	= .006
Is aware of recommendations for tuberculosis treatment and control						
Yes	1169	63.3	27.0	9.8		
No	254	41.3	35.0	23.6		
Total	1423	59.4	28.4	12.2	15.7[a]	< .001
Is aware of reporting requirement						
Yes	1299	60.8	27.7	11.5		
No	93	45.2	36.6	18.3		
Total	1392	59.8	28.3	11.9	11.9[a]	= .003
Patients include nursing home residents						
Yes	941	64.2	25.8	10.0		
No	482	50.0	33.4	16.6		
Total	1423	59.4	28.4	12.2	6.5[a]	= .04
Majority of patients > 60 years old						
Yes	811	64.6	26.3	9.1		
No	437	52.6	31.8	15.6		
Total	1248	60.4	28.2	11.4	8.2[a]	= .02
Majority of patients receive Medicaid						
Yes	171	46.8	37.4	15.8		
No	949	62.4	25.3	12.3		
Total	1120	60.0	27.1	12.9	13.6[a]	= .001
Source of tuberculosis information						
Personal experience						
Yes	750	59.9	31.3	8.8		
No	673	58.8	25.1	16.1		
Total	1423	59.4	28.4	12.2	12.2[a]	= .002
Professional publications						
Yes	1230	61.8	27.0	11.2		
No	193	44.0	37.3	18.7		
Total	1423	59.4	28.4	12.2	14.6[a]	= .001
CDC/ATS publications						
Yes	1000	64.0	26.2	9.8		
No	423	48.5	33.6	18.0		
Total	1423	59.4	28.4	12.2	5.9[a]	= .05

Note. CDC/ATS = Centers for Disease Control and Prevention/American Thoracic Society.
[a] Cochran-Mantel-Haenszel statistics; stratified by specialist vs generalist and year of medical school graduation.

were more likely to describe nonrecommended regimens.

Overall, the data point to the need for guidelines that emphasize the public health importance of adherence to treatment recommendations for tuberculosis. Treatment information must be available to physicians in a variety of formats so that it is accessible and useful.

The limitations to this study reflect the limitations of surveys. Busy respondents may not have answered the questionnaire

carefully; they may have referred to a colleague or to a published resource for the correct treatment regimen. (If this were so, however, it seems that more would have described recommended regimens.) Validation of responses, such as reviews of patient records, was not within the scope of the study. Nearly half of the original sample did not respond, and foreign-trained physicians were underrepresented. Although a low response rate is not surprising for physician surveys, nonrespondents and respondents may have had different knowledge about tuberculosis. Lack of knowledge could have been a reason for nonresponse; if so, results would represent better-informed physicians. While acknowledging these limitations, we cannot speculate beyond the data collected.

In 1993, a year after this survey, the CDC published new treatment recommendations that include an initial regimen of four drugs for all cases.[9] Since this survey, tuberculosis has received particular attention in the medical community and the media. But, while the emphasis on tuberculosis might have improved physician knowledge, two recent studies indicate that physicians may still be unaware of treatment recommendations. In one, only 46% of hospital housestaff described the currently recommended four-drug regimen for active tuberculosis, even though they serve a high-incidence population and 55% had current patients with active tuberculosis or infection.[10] The other showed that although 94% of physicians servicing public health facilities had diagnosed tuberculosis, only 53% described a recommended regimen.[11] These recent studies suggest that the spotlight on tuberculosis has not necessarily improved physicians' knowledge. Our 1992 survey data may provide a useful baseline for additional studies on providers' knowledge and use of treatment recommendations.

Even as gross estimates, these data are troubling. Inadequate regimens are associated with the development of drug resistance, continued disease, and opportunities for further infection in the community. Most of the physicians' regimen errors entailed a regimen of too long a duration. Although excessive regimens might cure tuberculosis, they may also lead to drug toxicity in patients and are a waste of health care resources. At this time of tremendous change in our health care system, these data require policymakers to consider which providers are best suited to treat tuberculosis patients, how providers should be trained and supported, and how correct treatment practices should be ensured. □

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